

REMARKS

Claim 1-5 and 36-60 are currently pending; claims 1, 2 and 4 having been amended by the present amendment; claims 6-35 having been canceled by the present amendment; new claims 36-60 having been added by the present amendment.

Claim Amendments

Claims 1, 2 and 4 have been amended by the present amendment. The Examiner presented a number of claim objections in the Official Action - each of which has been addressed by the present amendment. No new matter has been added. Further, claim 1 has been amended to specify families (b1)-(b10) in order to present a clear understanding of the claim.

Consideration and entry of the present amendment is respectfully requested.

New Claims

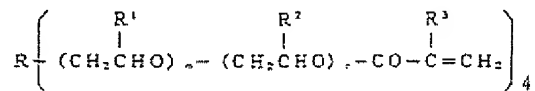
New claims 36-60 have been added by the present amendment. Support for each of claims 36-60 may be found in the "preferably" recitations of original claim 1. No new matter has been added. Further, claims 36-60 are patentable for at least the reasons claim 1 is patentable.

Consideration and entry of the new claims is respectfully requested.

§ 102 - Kono and/or Ishiko

Claims 1-5 stand rejected under 35 USC § 102(b) as being anticipated by Kono (USPN 6,399,254) (or its equivalent - EP 880,189). Further, claims 1-5 stand rejected under 35 USC 102(a) and/or 102(e) as being anticipated by Ishiko (USPN 6,190,804) (or its equivalent EP 923,147). Applicants respectfully traverse these rejections.

Ishiko describes the use, in an electrochemical cell, of a solid polymer electrolyte, wherein the polymer is a four-branched polymer having crosslinkable end groups, the polymer chain being a polyether chain. The formula is:



None of the Ishiko electrolyte examples contains an additive (b) of claim 1 of the present application.

According to the Examiner, (page 7, ¶ 6 of the Official Action), PVDF is present in all the working examples. However, the working examples in Ishiko are as follows:

Ex	Electrolyte (E)	Positive electrode	Negative electrode
1	A1 + PC + LiClO ₄ +black	LiCoO ₂ + (E)	C+PVDF+NMP
2	A2 + PC + LiClO ₄ +black	LiCoO ₂ + (E)	C+PVDF+NMP
3	A3 + γBL + LiClO ₄ +black	LiCoO ₂ + (E)	C+PVDF+NMP
4	A3 + γBL + LiClO ₄ +black	LiCo _{0.8} Ni _{0.2} O ₂ + (E)	C+PVDF+NMP
5	A3 + γBL + LiClO ₄ +black	LiCo _{0.2} Ni _{0.8} O ₂ + (E)	C+PVDF+NMP
6	A3 + γBL + LiClO ₄ +black	LiCo _{0.1} Ni _{0.8} Al _{0.1} O ₂ + (E)	C+PVDF+NMP
7	A4 + PC + LiBF ₄ +DME+black	LiCoO ₂ + (E)	C+PVDF+NMP
8	A5+EC+LiSCN+γBL+black	LiCoO ₂ + (E)	A5+C+γBL+LiSCN
9	A6+PC+LiTFSM	LiCoO ₂ + (E)	C+ A6+EC+LiTFSM
10	A7+EC+LiBO ₄ +DEC+black	LiMn ₂ O + (E)	C+PVDF+NMP
11	A8+sulfolane+LiClO ₄	V ₂ O ₅ +noir+PVDF+NMP	Li
12	A9+PC+LiClO ₄	V ₂ O ₅ +noir+PVDF+NMP	Li
13	A10+PC+LiTFSI+black	LiCoO ₂ +(E)	C+PVDF+NMP

In the above table, A1-A10 are tetrafunctional polymers. And, the PVDF is an additive (b) of the present invention. In some examples, said tetrafunctional polymer and PVDF are present simultaneously. However, it must be noted that they are not present in the same element of the electrochemical cell. In the examples, there is always a tetrafunctional polymer in the electrolyte, but there is never PVDF in the electrolyte.

Further, where there is PVDF in an electrode, there is no tetrafunctional polymer in the said electrode.

That is, there is never a tetrafunctional polymer and an additive (b) simultaneously in the same electrode/electrolyte.

Accordingly, the presently claimed invention is not described or suggested by Ishiko.

Further, Kono makes a similar disclosure as Ishiko. In Kono, no electrolyte contains a (b) constituent of the present invention. Further, applicants highlight that Kono (USPN 6,399,254) is not 102(b) art as asserted by the Examiner.

Accordingly, the presently claimed invention is not described or suggested by Kono.

The Examiner is respectfully requested to withdraw the rejections based on Kono and Ishiko.

§ 102 - Kerr

Claims 1-4 stand rejected under 35 USC § 102(e) as being anticipated by Kerr (USPN 7,101,643). Applicants respectfully traverse this rejection.

Kerr discloses a polymer electrolyte comprising a multiple-branched polymer optionally terminated by crosslinkable groups.

According to the Examiner, in the "background" part of the disclosure (col. 1, l. 43-50), the polymer electrolytes consist of a polymer derived from POE, a salt and optionally a plasticizer or an additive intended to lower the crystallinity of POE. The Examiner concludes that the material of claim 1 of the present invention is disclosed by Kerr.

However, the relied upon disclosure from the "background" is:

Numerous attempts have been tried to increase the conductivity by making POE derived polymers, such as block copolymers, comb-branch polymers containing ethylated poly(ethylene glycol) side chains, polymer networks, and adding plasticizer or additives to break down the crystalline phase, which is detrimental to the transportation of charge carriers.

This disclosure cannot be relied upon to teach the presently claimed invention. There is no disclosure of the presently claimed invention - there is no disclosure of using a four-branched polymer according to (a) in claim 1 with an additive (b). And, there is a specific teaching away from adding any extra additives to a polymer, as Kerr teaches such additives are detrimental to the transportation of charge carriers.

Further, applicants highlight the unexpected result of using a four-branched polymer according to (a) in claim 1 with an additive (b). Applicants provide the following conductivity values¹, measured at 22°C, for the samples of Examples 2-9 of the present application. The sample of example 2 is a comparative example, where the electrolyte contains no additive (b). The following table shows that addition of an additive (b) enhanced the conductivity at least by 20%, which is not suggested by

¹ Applicants can provide the following results in the form of a 37 CFR § 1.132 declaration at the request of the Examiner.

any of the above cited documents. In fact, in stark contrast, Kerr suggests that additives would be detrimental to the conductivity.

Sample #	Conductivity (mS/cm), 22°C	# Ex
Polymer solution 10 %	5.50 ± 0.01	Ex2
Polymer solution 10 % + SiO ₂	6.88 ± 0.01	Ex7
Polymer solution 10 % + TiO ₂ (XP-416)	6.80 ± 0.01	Ex3
Polymer solution 10 % + TiO ₂ (XP-413)	7.20 ± 0.01	Ex4
Polymer solution 10 % + TiO ₂ (XP-415)	6.62 ± 0.01	Ex5
Polymer solution 10 % + TiO ₂ (XP-414)	7.50 ± 0.01	Ex6
Polymer solution 10 % + PVDF	7.16 ± 0.01	Ex8
Polymer solution 10 % + PMMA	7.30 ± 0.01	Ex9

Accordingly, the presently claimed invention provides unexpectedly improved conductivity. The improved conductivity is especially unexpected when one skilled in the art considers the expectation for detrimental results taught by Kerr.

Accordingly, the rejection based on Kerr is respectfully requested to be withdrawn.

§ 103 - Kerr in view of Kono or Ishiko

Claim 5 stands rejected under 35 USC 103(a) as being unpatentable over Kerr in view of Kono or Ishiko. Applicants respectfully traverse this rejection.

The Examiner relies on Kono or Ishiko to allegedly teach a plasticizing agent. However, neither Kono nor Ishiko remedy the deficiencies of Kerr discussed above.

Accordingly, the rejection based on Kerr in view of Kono or Ishiko is respectfully requested to be withdrawn.

Conclusion

In view of the foregoing amendments and remarks, applicants respectfully request reconsideration and withdrawal of all outstanding rejections. Applicants submit that the claims are now in condition for allowance, and respectfully request formal notification to that effect. If, however, the Examiner perceives any impediments to such a notice of allowability, whether substantive or formal, the Examiner is encouraged to call Applicants' attorney at the number provided below. Such informal communication will expedite examination and disposition of this case.

Respectfully submitted,

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